

Vocational School Munich Chemistry/Biology Dr. Bernhard Thum	<b>Photometry</b>
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## Quantitative photometric analysis

### Analysis sample:

Common salt trituration of a water soluble colorant; w (colorant) between 0,1 and 0,5 %.

### Devices:

PC driven photometer  
 Analytical balance  
 Plastic cuvettes d = 10 mm  
 Measuring flask 50 mL; 100 mL  
 Volumetric pipette 5/10/15/20/25 mL

### Material and chemicals:

Reference substance: Brilliant green

### Experimental procedure:

For the determination of the extinction maximum an absorbance graph has to be acquired (range of wave length: 400-800 nm). Therefore a stock solution of the reference substance is to be prepared, which must be diluted in such a way that the extinction at  $\lambda_{\max}$  is approx. 0.5 – 1 extinction units. From the concentration of the solution, that is proper for the uptake of the extinction graph, a suitable measuring range for the calibration curve is to be derived. The absorption at  $\lambda_{\max}$  for the 5 calibrating solutions should be found between 0.2 and 1 extinction units.

Also it can be evaluated, how much of sample has to be weighed in and if a dilution is necessary for the sample solution to obtain a measuring point in the range of the calibration curve. The calibration solution and the sample solution are to be measured at *a fixed wave length* ( $\lambda_{\max}$ ).

### Analysis:

Hard copy of extinction curve and measured data at  $\lambda_{\max}$  regarding calibration and sample. The measuring data of the calibration solutions including the corresponding mass concentrations are to be filled in a excel spreadsheet chart. With the help of the diagramm assistant a linear regression is to be calculated, which will lead to the calibration curve. Using linear equation the concentration of the sample solution is to be determined. On the basis of the initial weight and in regard of a possibly conducted dilution the mass fraction of the colorant in the sample can be calculated.

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### Excel spreadsheet calculation:

All data (initial weight, volumes, dilution coefficients, mass concentrations, measuring data, etc.) that are necessary for the calculation, should be apparent from the excel spreadsheet chart. Let the program conduct the calculations by imbedding equations directly into the excel cells.

Generally use the correct measurement units (mg, mg/L, mL...). Please consider that extinction has no unit!

The calibration curve is created by marking the cells with mass concentration and extinction of the calibration solutions. Thereof a diagram (point x,y without connecting line) is created. Insert a trendline and flag the 3 cells at the bottom in »options«. Doing so, the formula and the coefficient of determination is obtained and the trendline is forced through zero. Because of the conducted zero adjustment the curve has no intercept.

